CLAIMS

1. A discharge lamp comprising a light-emitting portion formed of quartz glass, a pair of electrodes disposed in said light-emitting portion, sealing portions formed of quartz glass to hermetically seal said electrodes, and a noble gas charged in said light-emitting portion,

wherein the contents of hydrogen, oxygen and their compounds existing in the noble gas in the light-emitting portion is such that a maximums of the light-emitting spectral spectra intensities of hydrogen, oxygen and their compounds is 1/1000 or less of an intensity of the main light-emitting spectrum of the noble gas when the noble gas is discharged by supplying a current of 3 mA to said electrodes in said light-emitting portion, and

the content of OH groups included in the quartz glass of said sealing portion is 5 ppm or less by weight.

2. The discharge lamp according to Claim 1, wherein the quartz glass of the sealing portion has residual compressive stress in the vicinity of the interface between said glass and said electrode.

3. The discharge lamp according to Claim 2, wherein the residual compressive stress is 25 MPa or more and is not more than the breakage strength of said glass.

4. The discharge lamp according to Claim 1, wherein the content of OH groups in said quartz glass of said

light-emitting portion is 10 ppm or less by weight, and residual tensile stress in the quartz glass is 48 MPa or less.

5. The discharge lamp according to Claim 4, wherein said residual tensile stress in the quartz glass of the light-emitting portion is 7 MPa or less.

6. The discharge lamp according to Claim 4, wherein said residual tensile stress is 3.5 MPa or less.

7. The discharge lamp according to Claim 4, wherein the content of OH groups in said quartz glass of said light-emitting portion is 5 ppm or less by weight.

8. The discharge lamp according to any one of Claims 1 to 7, wherein mercury are sealed together with the noble gas in the light-emitting portion.

9. The discharge lamp according to any one of Claims 1 to 7, wherein a noble gas and a metal halide are sealed in said light-emitting portion.

10. A method of producing a discharge lamp comprising:

a step of forming a light-emitting portion, wherein a quartz glass tube including an OH group content of 5 ppm or less by weight is heated and softened to form a light-emitting portion having a predetermined shape;

a step of sealing an electrode, wherein an electrode assembly is inserted into a straight tube portion leading

to the light-emitting portion and said straight tube portion is heated and softened to seal the electrode assembly whose electrode is projected in the light-emitting portion; and,

a gas-charging step wherein a predetermined amount of a noble gas is charged and hermetically sealed in said light-emitting portion,

wherein in the gas-charging step the noble gas to be charged has the contents of hydrogen, oxygen and their compounds in which a maximums of the light-emitting spectral intensities of hydrogen, oxygen and their compounds is 1/1000 or less of an intensity of the main light-emitting spectrum of the noble gas when glow discharge occurs by supplying a discharging current of 3 mA, and,

after the gas-charging step the content of OH groups included in the quartz glass of said sealing portion is 5 ppm or less by weight.

11. The method according to Claim 10, wherein the method includes a dosing step inserting a predetermined amount of a light-emitting substance in a solid or liquid state into the light-emitting portion at room temperature after the step of sealing at least one electrode and before the gas-charging step.

12. A method of producing a discharge lamp comprising:

a step of forming a light-emitting portion wherein a quartz glass tube containing OH group content of 5 ppm or less by weight and closed at one end thereof is heated and softened to form a light-emitting portion having a predetermined shape;

a step of sealing a first electrode which comprises inserting a first electrode assembly from the open end portion of said quartz glass tube into a straight tube leading to said light-emitting portion to dispose at a predetermined position, evacuating the interior of said quartz glass tube from the open end portion thereof, charging a dry noble gas having the atmospheric pressure or less, closing said open end portion, and then, heating and softening the first electrode assembly disposed to form the first sealing portion;

a dosing step which opening the closed end portion of said straight tube portion leading to said light-emitting portion and not yet having an electrode to be sealed therein, and inserting a predetermined amount of a light-emitting substance in a solid or liquid state through said open end portion into the light-emitting portion at room temperature;

a step of inserting a second electrode assembly through the opening of the end portion which is opened at the dosing step to said straight tube portion leading to

said light-emitting tube portion and then disposing said second electrode assembly at a predetermined position;

a gas-charging step wherein the interior of the quartz glass tube is evacuated from said open-end portion, a dry noble gas having the atmospheric pressure or less is sealed, and said open-end portion is heated and softened to be closed; and,

a second electrode-sealing step wherein the quartz glass tube portion, in which said second electrode assembly is disposed, is heated and softened so as to seal said second electrode assembly,

wherein, in said gas-charging step, the noble gas to be charged has the contents of hydrogen, oxygen and their compounds in which a maximums of the light-emitting spectral intensities of hydrogen, oxygen and their compounds is 1/1000 or less of an intensity of the main light-emitting spectrum of the noble gas when glow discharge occurs by supplying a discharging current of 3 mA, and

in the electrode sealing steps for sealing the first and second electrode assemblies, said quartz glass tube is heated and softened by the irradiation of laser or plasma to seal said first and second electrode assemblies.

13. A method of producing a discharge lamp production comprising:

a step of forming a light-emitting portion in a quartz glass tube containing OH group content of 5 ppm or less by weight is heated, softened to form a light-emitting portion having a predetermined shape;

a dosing step wherein a first electrode assembly and a second electrode assembly are inserted from the open end portions of said quartz glass tube into a straight tube portion leading to said light-emitting portion and disposed at predetermined positions, and a predetermined amount of a light-emitting substance in a solid or liquid state is inserted into said light-emitting tube portion at room temperature at the same time;

a gas-charging step wherein the interior of said quartz glass tube is evacuated from said open-end portions, a dry noble gas having the atmospheric pressure or less is sealed, and said open-end portions are heated and softened so as to be closed; and

an electrode-sealing step wherein said quartz glass tube portions, in which said first and second electrode assemblies are disposed, are heated and softened so as to seal said first and second electrode assemblies,
wherein, at said gas-charging step, the noble gas to be charged has the contents of hydrogen, oxygen and their compounds in which a maximums of the light-emitting spectral intensities of hydrogen, oxygen and their

compounds is 1/1000 or less of an intensity of the main light-emitting spectrum of the noble gas when glow discharge occurs by supplying a discharging current of 3 mA, and,

in the first and second electrode sealing steps, the quartz glass tube is heated and softened by the irradiation of laser or plasma to seal said first and second electrode assemblies.

14. The method according to claim 13, wherein the second electrode assembly sealing step follows the first electrode assembly sealing step.

15. The method according to any one of claims 10 to 14, wherein, in the gas-charging step, the content of water in the noble gas to be sealed in said light-emitting portion is 5 ppm or less in mole ratio.

16. The method according to any one of Claims 10 to 14, wherein, in the gas-charging step, the content of water in the noble gas to be sealed in the light-emitting portion is 1 ppm or less in mole ratio.

17. The method according to any one of Claims 10 to 14, wherein prior to the gas-charging step, the method includes a step of eliminating all or part of hydrogen, oxygen and their compounds from the noble gas to be charged.

18. The method according to Claim 17, wherein, in the eliminating step, the noble gas to be charged is cooled

to solidify water included in the noble gas.

19. The method according to any one of Claims 10 to 14, wherein, in the light-emitting portion forming step, the quartz glass tube is heated and softened by the irradiation of laser or plasma to form the light-emitting portion.

20. The method according to Claim 19, wherein the light-emitting portion forming step is carried out in an atmosphere of a dry noble gas or nitrogen gas.

21. The method according to any one of Claims 10 to 14, wherein The method includes a heat treatment step of heating the quartz glass tube at high temperature to eliminate residual stress from the light-emitting portion after the light-emitting portion forming step.

22. The method according to any one of Claims 10 to 14, wherein the method includes a desorption vacuum heat treatment step of eliminating water adsorbed on the surface of the quartz glass by heating the glass in vacuum, and all the steps after the vacuum heat treatment step are carried out to in an atmosphere of a dry noble or nitrogen gas to complete a discharge lamp, without exposing the inner surface of the light emitting portion or the quartz glass tube to be formed into a light emitting portion to the air.

23. The method according to Claim 22, wherein the desorption vacuum heat treatment step is carried out before

the light-emitting portion forming step, and the quartz glass tube is be heated and softened by the irradiation of laser or plasma at the light-emitting portion forming step.

24. The method according to claim 22, wherein the desorption vacuum heat treatment step is carried out after the light-emitting portion forming step and before the dosing step.

25. The method according to Claim 22, wherein the desorption vacuum heat treatment step is carried out after the electrode sealing step and before the dosing step.

26. The method according to Claim 22, wherein the content of water in the dry noble gas or nitrogen gas is 5 ppm or less in mole ratio.

27. The method according to Claim 22, wherein the content of water in the dry noble gas or nitrogen gas is 1 ppm or less in mole ratio.

28. The method according to Claim 22, wherein in the method a vacuum heat treatment step for heat-treating the light-emitting substance in vacuum is added before or after the dosing step.

29. The method according to any one of Claims 11 to 14, wherein, in the electrode sealing step, the straight tube portion leading to the light-emitting portion is heated and softened so as to seal the electrodes while the outside of the light-emitting portion is cooled.

30. The method according to any one of claims 10 to 14, wherein, in the electrode sealing step, the quartz glass of the straight tube portion is heated and softened until the quartz glass makes contact with the electrode at high temperature so as to seal the electrode.

31. A discharge lamp according to one of claims 1 to 9, wherein the noble gas is argon gas.

32. The method according to any one of Claims 10 to 14, wherein the noble gas is argon gas.